

April 10, 1979

Mr. John J. Light  
Balanced Industries  
3505 Horse Drive  
Indianapolis, IN 46222

Dear Mr. Light:

This refers to your letter of March 24, 1979, in which you ask questions concerned the effect of various kinds of earth on copper pipe carrying freon.

Question: "What earth conditions cause copper to coat, reducing the conductance or attacking the copper causing leaks of freon?"

Answer: Generally cinders, marl, and soils containing organic acids derived from decaying organic matter, i.e., humus, soils containing sulfates and sulfate reducing bacteria, concentrations of sodium chloride and sodium sulphate are relatively corrosive to copper. The corrosivity of a given soil is governed by the porosity (aeration), electrical conductivity of the dissolved salts including depolarizers or inhibitors, moisture, and pH. When copper pipe is buried in any of the aforementioned soils or mixtures thereof, corrosion may occur. Products of corrosion would form films or coat the copper pipe reducing its heat conductivity and eventually the copper pipe wall would corrode and leak.

The most extensive field tests on various metals and coatings in practically all types of soils were initiated in 1910 by K. H. Logan of the National Bureau of Standards (NBS). These tests were published in 1957 by NBS Circular 579, "Underground Corrosion," M. Romanoff. We suggest that you obtain a copy of the study from a technical library or National Bureau of Standards, B354 Materials Building, Washington, D.C. 20234.

Question: "What copper, alloys, or coatings are best?"

Answer: The Materials Transportation Bureau does not certify or endorse proprietary items such as copper, alloys, or coatings for pipe. However, you may wish to contact the National Association of Corrosion Engineers, Group Committee T-10 "Underground Corrosion Control" at 1440 South Creek, Houston, Texas 77084, for additional information concerning the performance of copper and its alloys in various types of soil.

Sincerely,

Cesar DeLeon

Associate Director for  
Pipeline Safety Regulation

Materials Transportation Bureau

BALANCED INDUSTRIES

3/24/79

Office of Hazardous Materials  
Pipe Line Hazardous  
Materials Experts

Gentlemen:

I am an economist and builder. I plan to put in several hundred homes, with copper pipe (or an alloy, etc.) which will carry freon in it.

I need to know how earth of various kinds interact with copper (etc.) pipe, which is 5°F to 10°F colder than the earth around it. The copper will not be less than 35°F±. In Canada, in wet high water table sandy soil, the copper pipe had not difficulties in absorbing ground heat for 23+ years. In some soils in Indianapolis it has been successfully used. In a few cases a lime type accumulation occurred on the pipe after a few years, reducing the conductivity of the pipe.

Based on the good examples that worked we can provide heat very reasonably by this system. Much copper or copper alloy will be used. However, I want to know what earth conditions cause copper (etc.) to coat, reducing conductance or attacking the copper, causing leaks of freon. What copper, or alloy, or coatings, are best? I will deeply appreciate your help; and thus open up a new enormous market for copper.

Sincerely yours,

John J. Light

Attachments: 3